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# *NESTUCCA* OIL SPILL

# RESTORATION PLAN

By:

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February 1994

U.S. Fish and Wildlife Service
Ecological Services
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Olympia, WA

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# *NESTUCCA* OIL SPILL

# RESTORATION PLAN

**Proposed Action:** Restoration of common murres and other seabirds injured as a result of the 1988 *Nestucca* Oil Spill.

**Proposed By:**
U.S. Fish and Wildlife Service
Ecological Services
Olympia State Office
3704 Griffin Lane, S.E.
Olympia, Washington 98701
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**Legal Mandates:** Clean Water Act, Section 311(f)

43 CFR, Part 11

U.S. Fish and Wildlife Service Mitigation Policy, FR Vol. 46, No. 15, January 1981

**Action Locations:** Selected sites located along the Washington and Oregon coasts. The Pacific coast of Washington's Olympic Peninsula will be the primary location.

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***** DRAFT ***** ***** February, 1994 *****

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## *NESTUCCA* OIL SPILL RESTORATION PLAN

## EXECUTIVE SUMMARY

On December 22, 1988, the tug, *Ocean Service*, collided with the barge, *Nestucca*, which spilled more than 230,000 gallons of No. 6 fuel oil into the Pacific Ocean near Grays Harbor, Washington. Shorelines were oiled within Grays Harbor and along 110 miles of the Washington State coast north of Grays Harbor including portions of the Olympic National Park and five National Wildlife Refuges. Oil also reached south to Oregon State and north to Vancouver Island, British Columbia. More than 13,000 oiled migratory birds were recovered by wildlife rescue and rehabilitation operations; approximately 1,000 survived the oiling and were released. Estimates of actual migratory bird mortality from the spill range from 4 to 6 times greater than that collected.

In 1991, the United States of America settled claims for natural resource damages associated with the 1988 *Nestucca* oil spill. As part of the *Nestucca* damage settlement, the U.S. Department of the Interior (Interior) receives a total of $500,000 in annual installments of $50,000. The settlement proceeds shall be used to compensate for injury, destruction, or loss of natural resources within Interior's trusteeship. The U.S. Fish and Wildlife Service (Service) proposes to restore natural resources lost as a result of this spill. Restoration efforts will be focused on migratory birds, primarily common murres (*Uria aalge*) and secondly, other seabirds.

Seabird reproductive success, survival, colony size, and population size are regulated by the following factors: predation, parasitism, amount of breeding space, food availability, natural disturbances, and catastrophic events (Haley 1984; Croxall and Rothery 1991). The impact of these factors on seabirds can be exaggerated by human perturbations such as: intrusion disturbances, introduction of exotic species, habitat destruction, net fishing, pollution, and catastrophes, such as oil spills (Haley 1984; Speich and Wahl 1989).

This restoration plan focuses on determining what factors are most important in regulating common murre survival and reproduction in Washington and diminishing human perturbations at Oregon and Washington seabird colonies. The following actions are proposed:

1) educate pilots, boaters, fishermen, and other visitors to the Washington and Oregon coasts and National Wildlife Refuges about protected wildlife resources in these areas and explain the reasons for and methods of minimizing disturbance to seabirds and other wildlife;

2) improve habitat conditions for burrow nesting seabirds by eradicating the introduced European rabbit (*Oryctolagus cuniculus*) from Destruction Island;

3) delineate and describe seabird mortality resulting from the incidental take of seabirds in Washington net fisheries and identify and implement measures to reduce the mortality; and,

4) monitor common murre attendance at Washington breeding colonies to determine if the selected restoration actions are successful and to identify detriments to the survival and reproductive success of common murres and other seabirds.

The implemented restoration alternatives will be reviewed annually to determine if they are effective. If it is determined that the actions are not succeeding or other more effective alternatives are identified, the restoration plan will be revised.

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# *NESTUCCA* OIL SPILL RESTORATION PLAN

## 1.0 INTRODUCTION

On December 22, 1988, the tug, *Ocean Service*, collided with the barge, *Nestucca*, which spilled more than 230,000 gallons of No. 6 fuel oil into the Pacific Ocean near Grays Harbor, Washington. The resulting oil slick dispersed over 800 square miles from Grays Harbor north to Vancouver Island, British Columbia, Canada and south to Oregon. Shorelines were oiled within Grays Harbor and along 110 miles of the Washington State coast north of Grays Harbor and into the Strait of Juan de Fuca. Oil washed ashore on portions of the Oregon State and Vancouver Island, British Columbia coasts. The area oiled included portions of the Olympic National Park (ONP), Copalis, Flattery Rocks and Quillyute Needles National Wildlife Refuges (NWR), and Dungeness and Protection Island NWRs. More than 13,000 oiled seabirds were collected by wildlife rescue and rehabilitation operations conducted during the spill.

In 1991, the United States of America settled claims for natural resource damages associated with the 1988 *Nestucca* oil spill. As part of the *Nestucca* damage settlement, the U.S. Department of the Interior (Interior) receives $50,000 annually for a period of 10 years. Payments commenced December 1991. The court agreement states that "... settlement proceeds shall be used to compensate for injury, destruction, or loss of natural resources within the trusteeship of the U.S. Department of the Interior." The U.S. Fish and Wildlife Service (Service) proposes to restore natural resources lost due to the spill.

### 1.1 Purpose

The restoration funds were recovered under Section 311(f) of the Clean Water Act. Prior to expenditure of funds, a restoration plan must be prepared. Guidance, which is applicable to the Clean Water Act, for the restoration, replacement, or acquisition of equivalent resources is contained in 43 CFR Subtitle A, Section 11.93 of the Interior Natural Resource Damage Assessment regulations.

Additionally, in planning and implementation of restoration actions, the Service gives priority to alternatives which result in restoration of in-kind natural resources at the same location and vicinity, as required by the Service's Mitigation Policy, FR Vol. 46. No. 15, January 1981. The *Nestucca* Oil Spill Restoration Plan (Plan) has been developed in accordance with these regulations.

The damage claim for injured natural resources was based on the 55,912 migratory birds estimated to have died as a result of the *Nestucca* oil spill (Ford, et al. 1991). The number of birds actually recovered through rescue and rehabilitation efforts totaled 13,473 (Table 1). Approximately eight percent (1,046) of the birds survived the oiling and were released following rehabilitation (Ford, et al. 1991). Survivorship of the released birds is unknown.

Eight months following the spill, shallow subtidal sediments and fauna in oiled areas of the ONP were sampled for evidence of oil and its effects (Carney and Kvitek 1990). No evidence of oil or its effects were detected.

Prior to and after the spill, Dethier (1991) studied intertidal plants and animals in rocky (exposed and protected), cobble, and sand habitats from Grays Harbor to Cape Alava, Washington. An unusual freeze event occurred six weeks after the spill. Oil spill effects on plants and animals were not detectable due to natural variation between sites and the effects of the freeze event.

A second study was conducted in an intertidal rocky habitat of the ONP (Kinnetic Laboratories, Inc. 1992). Differences in community structure were determined by Bray-Curtis percent similarity analysis between control plots and experimentally cleared or oil impacted plots. Although experimentally cleared and oil impacted plots were recovering as demonstrated by increases in the percent similarity during the course of the study, they were still different from controls three years after the spill.

Seabirds and waterfowl were the migratory birds most impacted by the spill (Table 1). Of the 13,473 birds recovered during the spill, 8,091 (60%) were common murres (*Uria aalge*). Thirty-nine species of birds comprised the remaining 40%, but no one species exceeded 5% of the total except the Cassin's auklet (*Ptychoramphus aleuticus*) which comprised 8% of the total. Scoters, grebes, and auklets accounted for 25% of the total.

Only seven shorebirds were recovered. However, Larsen and Richardson (1990) observed 3,574 oiled shorebirds in and adjacent to Grays Harbor that were mobile despite being oiled. Their fate was undetermined. Larsen and Richardson assumed that the total shorebird mortality was higher than the seven birds recovered because the effects of oil ingestion and oiled plumage may include behavioral and internal aberrations that rendered the shorebirds more susceptible to predation, disease, and starvation.

Sixteen of the 40 species of birds impacted by the spill are known to breed in Washington and these species comprise 67% of the total mortality (Table 1). The number of adult individuals that actually bred in Washington can not be determined at this time. Many of the same species migrate to or through Washington. The remaining 25 species are birds that migrate through or winter in Washington. Only a few individuals of many of these species were impacted by the spill and their populations presumably were not significantly impacted.

Since it is the intent of the Service to restore resources injured as a result of the spill and migratory birds were the primary documented resource injury, the Plan addresses only migratory birds. The focus of the Service's restoration is on actions that will benefit common murres first and other seabird species second. Emphasis is placed on common murres for two reasons. First, the majority of the migratory birds that were killed as a result of the *Nestucca* oil spill were common murres. The total common murre mortality due to the spill is estimated at 30,000 individuals (Ford, et al. 1991).

Secondly, the common murre population in Washington State declined 89%, from 28,940 individuals in 1982 to 3,190 in 1983 (Wilson 1991). Wilson attributed the decline to a 1982-1983 El Niño-Southern Oscillation (ENSO) warm water event. Since that time, the common murre breeding population has fluctuated around 3,000 birds. Wilson's counts at Washington breeding sites conducted during breeding seasons prior to and following the spill showed that there were 220 common murres less following the spill, a decrease of approximately 6%. It can not be determined from this data if the decrease represents an actual reduction in the common murre breeding population because the data are based on a single annual count and the difference could be within the margin of error.

## 1.2 Location of Proposed Restoration Actions

The restoration area includes the Oregon and Washington coasts from the Winchuck River, Oregon to Port Townsend, Washington (Figure 1). This area was selected by the *Nestucca* Oil Spill Restoration Planning Committee (Committee) for the following reasons.

The Washington coast is included within the restoration area because it was directly impacted by the spill. The portion of the Washington coast between Grays Harbor and Port Townsend will be emphasized because 88% of Washington's seabirds and 100% of Washington's common murres breed within it (Speich and Wahl 1989), although no birds were breeding at the time of the spill. This area also includes the Copalis, Flattery Rocks, Quillayute Needles, Dungeness, and Protection Island NWRs; the ONP; and the proposed Olympic Coast National Marine Sanctuary (Figure 1).

The number of common murres that occur in Washington waters during the winter are much greater than the numbers reported during the breeding season (Wahl, et al. 1981; Briggs, et al. 1992). Thus, it is likely that some of the common murres impacted by the spill originated from outside of Washington State. The estimated total common murre mortality attributed to the spill (30,000) also far exceeded the number of common murres breeding in Washington prior to the spill. It is probable that a portion of these birds were non-breeding birds from Washington, while others may have come from colonies located outside of Washington. Common murres from Oregon and possibly British Columbia winter in Washington's waters (Tuck 1961; Wahl, et al. 1981).

There is a high probability that common murres originating from Oregon colonies died along the Washington coast as a result of the *Nestucca* spill. Following the breeding season in Oregon, common murres have been observed moving north (Roy Lowe, U.S. Fish and Wildlife Service, personal communication 1993) and band recoveries of common murres banded in Oregon colonies show that the greatest percentage of recoveries for common murres, one year of age and older, occurred along the Washington outer coast and the Strait of Georgia (Bayer and Ferris 1987). The Oregon common murre breeding population is estimated to contain more than 700,000 birds (Roy Lowe, U.S. Fish and Wildlife Service, personal communication 1993), while the British Columbia and Washington colonies combined contain less than 20,000 birds (Wilson 1991; Byrd, et al. 1993). Due to the high probability that common murres from

Oregon died in the spill, the Oregon coast from the Columbia River to the Winchuck River is included in the restoration area.

## 2.0 SEABIRDS

The majority of birds known to have been impacted by the *Nestucca* oil spill, including 10 of the 16 species that breed on the Washington coast, are seabirds (Table 1). These are birds whose normal habitats and food sources are on or over salt water and are typified by alcids, cormorants, loons, some ducks, pelicans, gulls, and terns (Terres 1980). Some seabirds, such as gulls, terns, and cormorants, spend most of their time near shore and roost on or near shore. Other seabirds, such as murres, auklets, and storm-petrels, only come to land intermittently or to breed (Speich and Wahl 1989).

Seabird reproductive biology is characterized by delayed onset of reproductive activity, low reproductive rates, and long life spans (Speich and Wahl 1989; Croxall and Rothery 1991). Seabirds tend to delay reproductive activities for three or more years after they fledge. Species that spend most of their time at sea produce a single egg, and species that tend to remain near shore may produce as many as 5 eggs (Haley 1984; Croxall and Rothery 1991). The common murre generally initiates breeding in its fourth or fifth year and lays one egg; a second egg may be laid to replace a lost egg (Tuck 1961; Birkhead and Hudson 1977).

The life spans of some seabirds may exceed 50 years (Speich and Wahl 1989). The typical annual adult survivorship for seabirds, including the common murre, is around 90% (Birkhead and Hudson 1977; Croxall 1987; Sydeman 1993).

Some seabirds return to the same site to breed each year and will infrequently move to new sites. In a study of marked common murres, 95% of the individuals returned annually to the same breeding site (Birkhead 1977). Hedgren (1980) also found a high rate of nest philopatry in marked common murres. Nest philopatry has been demonstrated in thick-billed murres and tufted puffins (Gaston and Nettleship 1981; Harris 1984).

Almost all (99%) marine nesting birds are colonial breeders (Lack 1968). The colonies vary in size and density according to species and location (Lack 1968; Haley 1984). Common murre colonies on Southeast Farallon Island ranged from 10 to 5,000 pairs (Sydeman 1993). The smaller common murre colonies were associated with cliff ledges and the larger with boulder fields and scree slopes.

Breeding success is related to colony density (Birkhead 1977; Harris 1984). Birkhead (1977) found that breeding success of common murres was greatest when nest density was high (breeding success 87.5%). Breeding success was 73.9% when nest density was medium and 30.8% when low. The differences in breeding success were due to predation.

The breeding success of common murres is also influenced by the experience of the breeding pair. Inexperienced breeders generally exhibit lower reproductive success (Tuck 1961; Birkhead and Hudson 1977).

Among the factors affecting seabird reproductive success, survival, colony size, and population size are predation, parasitism, breeding space, food availability, and catastrophic events, such as ENSO warm water anomalies (Croxall and Rothery 1991; Wilson 1991). Populations of seabird species with long life spans and low reproductive rates are more sensitive to changes in adult survival than to changes in juvenile survival or breeding success (Croxall and Rothery 1991). A seabird population is likely to decline if adult mortality is increased.

## 2.1 Human Factors Regulating Survival and Reproductive Success of Common Murres and other Seabirds

Due to their life-histories, low reproductive rates and delayed sexual maturity, common murres and other seabirds are susceptible to a variety of human perturbations, especially at breeding sites, which can exaggerate the effects of the above factors on seabirds (Anderson and Keith 1980; Speich and Wahl 1989; Croxall and Rothery 1991). Human perturbations include: oil spills, pollution, net fishing, intrusion disturbances, introduction of exotic species, and habitat destruction, (Haley 1984; Speich and Wahl 1989). The loss of reproductive adults due to human perturbations can diminish seabird colony size and density. The surviving birds may be more susceptible to predators and disturbances.

The number of seabird mortalities resulting from spills of oil and/or hazardous materials range from a few birds to hundreds of thousands depending on: 1) the seabird species; 2) the physical properties, toxicity and persistence of the material; 3) the quantity spilled; and, 4) the distance the material disperses. Diesel fuel is more toxic than crude oil, but it does not disperse as far because of its physical properties (evaporates readily). Crude oil, though not very toxic, can disperse over hundreds of miles and persists longer in the environment than diesel fuel.

Birds are affected by oil in several ways, external oiling, ingestion, egg oiling, and habitat changes (Albers 1991). Birds that spend nearly all their time on the water surface, such as grebes, common murres, and loons, are more susceptible to oiling during oil spills than other species such as gulls (Speich and Wahl 1989). Oil can coat a bird's plumage resulting in a loss of buoyancy and insulation that causes the bird to drown or die of hypothermia. The sublethal effects of oil ingestion include increased mortality from predation, starvation, and disease (Albers 1991).

Reproductive success can be altered by oil. Fry (1987) found that breeding success in Cassin's auklets and wedge-tailed shearwaters (*Puffinus pacificus*) was reduced following exposure to oil. Egg laying, breeding success, and mate fidelity were adversely affected by the oiling. Spills can affect reproduction of an entire colony through the loss of experienced adult breeders. Following the *T/V Exxon Valdez* spill, common murre colonies in oiled areas contained fewer breeding individuals than in unoiled areas. Breeding was delayed and reproductive success was below normal in these colonies (Nysewander, et al. 1993). Mortality of embryos can result when eggs are oiled, especially during the early stages of incubation (Albers 1991).

Pollution, such as stormwater runoff, pesticides, ocean dumping, and other chemical contamination, can impact seabird survival and their ability to reproduce successfully through alteration of habitat or more directly through intake of the toxins. Altered habitat may affect the prey base and/or the availability of cover. Organochlorine pesticide induced eggshell thinning reduces reproductive success. Organochlorine induced eggshell thinning was determined to be a factor in the decline of the California brown pelican (*Pelecanus occidentalis californicus*) during the 1960's and early 1970's (Stickel 1973, Gress and Anderson 1983).

Net fisheries impact adult and juvenile seabird survivorship when seabirds become tangled in nets and drown (Haley 1984). Seabird take in net fisheries has been recorded in Alaska, California, Newfoundland, British Columbia, Norway, Greenland, Ireland, and Scotland (King, et al. 1979; Carter and Sealy 1984; Takekawa, et al. 1990). Diving birds, such as puffins, murres, grebes, and loons are the most susceptible to being caught in fishing nets (Ainley, et al. 1981; Haley 1984).

The number of birds taken incidentally in net fisheries can be substantial. Gill net fisheries were estimated to be responsible for more than 200,000 thick-billed murre (*U. lomvia*) mortalities annually in Greenland during the early 1970s (Atkins and Heneman 1987). The annual incidental take of seabirds in the mothership fishery near Alaska was estimated at 266,500 seabirds (Ainley, et al. 1981).

The cumulative effect of the chronic mortality of adults and young birds caused by net fisheries may result in colony recruitment rates that are too low to sustain the colony. Takekawa, et al. (1990) estimated that incidental take from gill netting was the primary factor leading to a 52.6% decline of the common murre population in central California between 1980 and 1986. Carter and Sealy (1984) estimated that gill net fishing accounted for almost 8% of the annual marbled murrelet (*Brachyramphus marmoratus*) mortality during 1980 in British Columbia, Canada.

Seabird gill net mortality is higher when fishing is conducted near breeding colonies. Ainley, et al. (1981) concluded that fishing within 50 to 75 nautical miles of colony islands would severely reduce the populations of some species of diving birds. Takekawa, et al. (1990) found that common murre declines were most severe in colonies located nearest to areas of gill net fishing.

Breeding adult common murres particularly can be disturbed by boats, aircraft, introduced non-native wildlife and domestic animals, and pedestrians entering or approaching too close to colonies. When breeding birds are disturbed, they may leave their nest or colony in a panic flight, sometimes knocking eggs from their nest sites, and leaving the remaining eggs and chicks exposed to predation from gulls, ravens, and crows (Kury and Gochfeld 1975; Ellison and Cleary 1978; McKnight and Knoder 1979; Speich and Wahl 1989). Exposed eggs and chicks may also succumb to either hyper- or hypothermia (Anderson and Keith 1980). Repetitive disruption of breeding adults may cause them to abandon the breeding site (Haley 1984; Anderson 1988).

Birkhead and Hudson (1977) found that the disturbance created by marking birds caused some individuals to leave the breeding site and not return. Hedgren (1980) reported that common murres were more likely to shift nesting locations if they failed to rear a chick due to disturbance or other reasons.

Burrow nesting seabird habitat can be destroyed directly through the introduction of domestic and/or exotic animals (Jones and Byrd 1979). Introduced species can adversely affect nesting colonies by altering seabird habitats. For example, goats, sheep, and rabbits can alter or destroy vegetation communities on islands resulting in habitat that is no longer suitable for seabirds or loss of habitat from increased erosion (Jones and Byrd 1979). An introduced species may also compete for space. For example, the European rabbit (*Oryctolagus cuniculus*) excavates extensive warrens which may occupy the space of burrow nesting birds in addition to increasing the rate of erosion and destroying vegetation (Couch 1920; Ely and Clapp 1973).

## 2.2 Potential Factors Impacting Coastal Washington and Oregon Common Murres and other Seabirds

The potential exists for many of the factors discussed in Section 2.1 to impact common murres and other seabirds along the Washington coast. Though the decline of the common murre population in the early 1980's appears to be related to the 1982-83 ENSO (Wilson 1991), it is unknown why the population level has remained depressed.

Wilson (1991) suspects that Washington's common murres are adversely impacted by oil spills, gill-net mortality, U.S. Navy practice bombing, and natural events such as ENSO-like warm water anomalies. Speich and Wahl (1989) list oil spills, gill netting, and purse seining as causes of seabird mortality in Washington. In addition to natural factors, one or more of the human perturbations discussed below may contribute to the inability of the common murre population to increase following its decline in 1983.

The estimated risk for an oil spill exceeding 1,000 barrels to occur in the area between southern British Columbia and northern Washington is once every 1.3 years (Burger 1992). The actual rate of occurrence of oil spills greater than 1,000 barrels off the coasts of southern British Columbia and northern Washington was once every 3.4 years between 1985 and 1991 (Burger 1992). Avian mortality associated with these spills ranged from none reported to an estimated 68,500 birds (Ford, et al. 1991; Burger 1992). Generally, common murres composed the bulk of the mortality as demonstrated in the *Nestucca* spill (Table 1) and the 1991 *Tenyo Maru* oil spill during which over 3,000 common murre carcasses (73% of the total) were collected.

There are anecdotal accounts of seabird mortalities resulting from gill net and purse seine fisheries in Washington (Speich and Wahl 1989). The number of mortalities is not documented, but the mortality could be substantial based upon reports of some fishermen (Atkins and Heneman 1987; Speich and Wahl 1989). According to Speich and Wahl (1989), the gill net fishery is the fishery most responsible for seabird mortalities in Washington.

The Washington Department of Wildlife identified areas east of Cape Flattery where fisheries and seabird concentrations are likely to overlap (Troutman, et al. 1991). The area around Cape Flattery was identified as a high entanglement risk area because of the local fishery's proximity to important seabird nesting areas.

The species assumed to be most impacted by net fisheries in Washington are the western grebe (*Aechmorphorus occidentalis*), the common murre, and the marbled murrelet (Speich and Wahl 1989). On September 28, 1992, the marbled murrelet was listed as threatened under the Endangered Species Act of 1973, as amended. The Washington Department of Wildlife classifies the marbled murrelet as sensitive, and the species will be designated as a Washington State threatened species in August of 1993 (Eric Cummins, Washington Department of Wildlife, personal communication 1993).

It is interesting to note that the common murre population in California declined in the early 1980's, corresponding to the decline of common murres in Washington. Apparently, the California population was also impacted by the 1982-1983 ENSO. However, the decline of central California colonies was more severe than northern California colonies, and this was related to gill-net fishing and oil spills (Takekawa, et al. 1990).

Human disturbance of seabird colonies located on the Washington and Oregon coasts occurs from boats and aircraft operating in close proximity to colonies and from occasional trespass into colonies by humans gaining access either by boat or on foot during low tide cycles. The effects of these disturbances on Washington and Oregon seabird colonies and reproductive success has not been documented. A study of the effects of practice bombing and colony overflights by high speed, low altitude military aircraft on marine organisms located near Sea Lion Rock located off the Washington coast was conducted by Speich, et al., (1987). It was determined that these activities cause visual and/or auditory perturbations which disrupt the breeding activities of seabirds. The U.S. Navy discontinued the practice bombing of Sea Lion Rock in 1993.

In Washington, private, military, and U.S. Coast Guard aircraft and boat traffic have been observed passing close to coastal NWR islands which support seabird colonies causing birds and mammals to flee in panic (Speich, et al. 1987; Wilson, U.S. Fish and Wildlife Service and Eric Cummins, Washington Department Wildlife, personal communications 1993). National Park Service (NPS) personnel have noted boats anchoring close to the islands and have occasionally observed campfires on a few of these islands (Paul Crawford, NPS - ONP, personal communication 1992). As sea kayaking grows in popularity, boater and pedestrian disturbances may increase at the more accessible sites.

In Oregon, the Oregon Coastal Refuges office has documented numerous disturbance events resulting in seabirds and pinnipeds stampeding from rocks and islands within Oregon Islands and Three Arch Rocks NWR's (Roy Lowe, U.S. Fish and Wildlife Service, personal communication 1993). Disturbance to seabirds and marine mammals has occurred due to the operation of various watercraft including commercial, charter, and recreational fishing/diving boats, jet skis and sea kayaks. Low flying aircraft are also a problem in Oregon including private, military and U.S. Coast Guard aircraft. Trespass into colonies accessible at low tides is a recurring problem. Continuing increases in human use of the refuges threatens the stability of the Oregon colonies.

An exotic species, the European rabbit, was introduced on Destruction Island during the 1970's. The rabbit population has altered vegetation and increased the rate of erosion on the island, which is suspected to have impacted the breeding habitat of burrow nesting seabirds on the island, such as the tufted puffin (*Fratercula cirrhata*) and the rhinoceros auklet (*Cerorhinca monocerata*) (Aubrey and West 1984; Hesselbart 1991). Since the Destruction Island lighthouse was automated in the early 1970's, common murres and cormorants have occupied the island (Dave Nysewander, Washington Department of Wildlife, personal communication 1993). The rabbits' presence may be limiting the use of Destruction Island by smaller birds like storm-petrels and Cassin's auklets.

## 3.0 SEABIRD RESTORATION ALTERNATIVES

Restoration alternatives can be classified as: direct on-site, indirect on-site, off-site, and no action. Direct on-site alternatives occur at the breeding site and are aimed at increasing the reproductive success of the targeted species. Indirect on-site alternatives focus on reducing other species' impacts on the target species at their breeding sites. Off-site restoration alternatives reduce competition for resources and increase survivorship of the target species. The no action alternative allows the species to recover naturally.

Examples of direct on-site restoration include social stimulation, habitat manipulation, and release of captive reared birds. Social stimulation techniques utilize decoys and taped vocalizations to encourage breeding birds to congregate in higher densities and to improve breeding synchrony. Decoys and taped vocalizations can also be used to attract birds to former colony sites (Kress, et al. 1992). Habitat at breeding sites can be altered to increase the available nesting area. For example nesting ledges can be built or enlarged, and/or debris, soil, and vegetation can be cleared to create suitable habitat. Protective structures can be erected to exclude predators, such as gulls and raptors. Birds can be reared in captivity and released at colony sites. Eggs or chicks from stable or expanding colonies can be transferred to less successful or new sites (Kress and Nettleship 1988).

Examples of indirect on-site alternatives include predator control, competitor control, and reduction of human disturbance. Dummy eggs treated with bird repellent placed in colonies condition avian predators to avoid eggs of the species to be restored. Predators such as gulls have been successfully controlled in Maine through the use of poison baits, nest destruction, and shooting (Kress, et al. 1992). Introduced exotic species, such as goats, foxes, rats, and rabbits, which may predate on or alter the habitat of the target species, can be removed from colony islands. Human disturbances can be reduced or eliminated through education of and/or by restricting the access of pedestrians, pilots, and boat operators to colonies.

Off-site restoration alternatives examples include increasing survivorship of the target species by reducing or eliminating the mortality of seabirds resulting from oil spills, pollution, and fishing activities. For example, fisheries regulations may be implemented to increase seabird survivorship and productivity by reducing competition for the targeted species' prey items. The reproductive success of seabirds can be improved through regulations which limit the discharge of pollutants which interfere with reproductive processes. Reproductive success of the California brown pelican improved and its population began to recover following the ban of organochlorine pesticides (Gress and Anderson 1983).

## 4.0 PROPOSED RESTORATION ALTERNATIVES

The choice of appropriate alternatives is determined by the target species, its natural history, and the factors which are impacting it. The species to be restored and its habits will determine which alternatives listed in Section 3.0 are applicable to restore the species. Many of the alternatives have not been tested or used enough to know if they are applicable or effective in all situations. A brief description of the seven alternatives considered by the Committee follows.

Education. The goal of the education alternative is to increase seabird reproduction through decreased human disturbance. This will be accomplished through the education of pilots, boaters, fishermen, and other visitors to the Washington and Oregon coasts and coastal NWRs about protected wildlife resources in these areas and to explain the reasons for and methods of minimizing disturbance to seabirds and other wildlife. This alternative is expected to improve seabird reproductive success by decreasing human disturbances on and adjacent to Washington's and Oregon's coastal NWR islands. As discussed in Section 2.0, human disturbances can adversely affect seabird reproductive success (Kury and Gochfeld 1975; Anderson and Keith 1980; Anderson 1988; and Speich and Wahl 1989). Species nesting on NWR islands, such as common murres and cormorants, will benefit from educational activities. Additionally, birds that forage and raft near these islands should also benefit from reduced disturbances. The education alternative is detailed in Section 4.4.

Destruction Island Habitat Improvement. It is expected that habitat conditions for burrow nesting seabirds and resident mammals on Destruction Island will be improved by the eradication of the European rabbit. This program will remove an introduced species which is altering the island's habitats and increasing erosion. Removal of European rabbits from Smith Island, Washington resulted in the successful restoration of seabird nesting habitat (Jones and Byrd 1979). The Destruction Island habitat improvement alternative is detailed in Section 4.5.

Net Fishery. As discussed in Sections 2.1 and 2.2, seabird mortality resulting from net fisheries in Washington's waters may be substantial. This investigation will document the amount of seabird mortality and develop and implement a strategy for eliminating or reducing mortalities from net fisheries. This alternative is detailed in Section 4.3.

Monitoring. To determine if the goals of the preferred alternatives are being achieved, common murres and other seabirds attending coastal Washington breeding colonies will be monitored from the air and land. As stated in Section 2.3, it is unknown which factors are most important in limiting the common murre population on the Washington coast. Monitoring the colonies will provide some information about these factors. This information will be used to revise the Plan to include alternatives that will mitigate or correct those factors identified as impacting common murres. The monitoring alternative is detailed in Section 4.2.

Social Stimulation. There are many islands that once supported common murre colonies on the Washington coast. Common murres sometimes occupy these islands, but they do not appear to be breeding (Ulrich Wilson, U.S. Fish and Wildlife Service, personal communication 1993). Social stimuli alternatives may be considered in the future if monitoring data show that these common murres are exhibiting reproductively unusual behaviors. The locations where these methods could potentially be implemented are limited on the Washington coast due to logistical problems associated with adverse environmental conditions.

Habitat Manipulation. Seabird breeding habitat does not appear to be limited in Washington State (Julia Parrish, University of Washington, personal communication 1992). Therefore, habitat manipulation alternatives were not considered appropriate by the Committee. This conclusion is based on censuses which document that the coastal islands previously supported ten times as many breeding common murres (Speich and Wahl 1989; Wilson 1991). Manipulation of habitat is also very costly because of the labor and logistical problems of working on the small, rocky, and usually inaccessible islands of the Washington coast.

No Action. By implementing the No Action alternative, the common murre population would be allowed to recover naturally and activities to enhance common murre the recovery would not be implemented. Breeding numbers of common murres have not recovered since they dropped ten years ago. It is assumed that factors, such as spills, gill netting and human disturbances, are preventing the breeding numbers from returning to previous levels. Under this alternative, no actions could be taken to lessen the impacts of these factors. Therefore, it does not seem likely that the No Action alternative will result in recovery.

The preferred alternatives selected by the Committee for restoring resources lost due to the *Nestucca* Oil Spill are: Education, Destruction Island Habitat Improvement, Net Fishery, and Monitoring. These alternatives were chosen based on the following considerations: 1) the alternative's potential for restoring injured resources and reducing or eliminating negative impacts on common murres and other seabirds; 2) budget; and 3) logistics. Sections 4.1 through 4.4 contain detailed descriptions of the Committee's preferred alternatives.

## 4.1 Preferred Alternative - Education

Goal(s): The goal of this alternative is to increase seabird reproduction by reducing and/or preventing the potential impacts on seabirds caused by human disturbance through the education of persons most likely to cause disturbances.

Justification: It has been documented that seabird reproductive success is reduced through disturbance resulting from human intrusion into colonies (Anderson and Keith 1980; Anderson 1988; Hunt 1972; and Kury and Gochfeld 1975). As discussed in Section 2.2, boats, private and military aircraft, and people have been observed near or on the coastal NWR islands. Birds and mammals have been observed to leave the islands in panic flights as a direct result of these disturbances. The frequency and effects on breeding seabirds of these disturbances have not been documented. However, the frequency of occurrence is expected to increase as coastal recreational opportunities become more popular.

As the disturbance of common murre colonies is reduced and/or prevented, common murre reproductive success may increase. Reduction of disturbance may also benefit other species that nest on the NWR islands.

Proposed action(s): Educate the public about the natural resources that occur on the Washington and Oregon coasts which are protected by the Service, NPS, and the National Oceanic and Atmospheric Administration (NOAA). Develop and produce educational brochures and posters which describe the wildlife using the coastal NWR islands, why these islands and wildlife are protected, and how to avoid disturbing the wildlife on these islands. Educational interpretive three by five foot porcelained panels containing the same information will be posted at five boat launch sites on the Washington coast. Additionally, four by eight foot signs will be posted on Destruction and Ozette Islands that advise boaters to stay a minimum of 200 meters away from the islands.

Nisqually NWR, in coordination with Oregon Coastal NWR, will develop and distribute informational brochures and laminated posters that delineate the Washington and Oregon coastal areas under the protection of the Service, NPS, and NOAA. The brochure will contain 12 panels in 2 colors and will include information about seabirds, marine mammals and other species that benefit from protection of the islands. The laminated poster will include the same map as the brochure and contain information about how and why to avoid disturbing the protected wildlife on the Refuge islands. Nisqually NWR will design and post the four by eight foot signs on Destruction and Ozette Islands.

Nisqually NWR will coordinate with Oregon Coastal NWR, the ONP and other agencies, such as NOAA-Sea Grant and the Washington Department of Fisheries and the Washington Department of Wildlife, to disseminate informational materials to commercial and recreational fishermen, tribal fishermen and ONP visitors. Nisqually NWR will coordinate with the Federal Aviation Administration to inform commercial and private pilots about distances and altitudes to maintain when flying in the area of seabird inhabited islands.

Location(s): Post laminated posters and/or distribute brochures at commercial, private, and public boat launches and marinas, popular kayak launch sites, and Refuge and ONP visitor contact stations along the Washington and Oregon Coasts from to Port Townsend, Washington to the Winchuck River, Oregon. Post four by eight foot signs on Destruction and Ozette Islands. Post the porcelained panels at boat launch sites at Sekiu, La Push, Neah Bay, Ilwaco, and Westport, Washington.

Schedule: Initiate the alternative in 1994. Complete material designs during 1994. Distribute brochures and laminated posters prior to the start of the breeding season in 1995. Replace the brochures and posters prior to the breeding season each following year, as necessary, until 2003. It is anticipated that the four by eight foot signs will require replacement at a minimum of every five years; therefore, replacements will be purchased at the same time as the originals. The signs will be placed on the islands as soon as they are received, probably during Fiscal Year 1995, by Nisqually NWR. The signs will probably have to be replaced during Fiscal Year 1999.

Estimated Budget: $85,000

### 4.2 Preferred Alternative - Destruction Island Habitat Improvement

Goal(s): Increase and stabilize seabird habitat on Destruction Island through the elimination of the European rabbit, an introduced species.

Justification: European rabbits were introduced on Destruction island during the early 1970's. The rabbits construct extensive tunnels and warrens and keep the island's herbaceous vegetation, primarily turf grasses, closely cropped. Aubrey and West (1984) noted that these activities were accelerating erosion of the island and were destroying or occupying the breeding habitat of burrow nesting seabirds such as the tufted puffin and the rhinoceros auklet.

Eliminating rabbits from the island should result in taller and denser stands of grasses as demonstrated by rabbit exclosures placed on the island in 1988. It is expected that the resulting increase in plant cover and detrital accumulation will benefit seabirds by:

1) stabilizing soils on slopes with high seabird nest burrow densities resulting in a decrease in the rate of burrow collapse;

2) attracting more seabirds to the flat island top, increasing the overall productivity of Destruction Island for seabirds; and,

3) retarding the overall rate of soil erosion preserving a crucial component of burrow nesting seabird habitat.

Additionally, the action should benefit two of the island's native mammalian species, Destruction Island shrew (*Sorex trowbridgii destructioni*) and Gibb's shrew mole (*Neurotrichus gibbsii*), which are also losing habitat to and being displaced by the rabbits (Aubrey and West 1984).

Since the mid 1970's, various rabbit control measures have been implemented on the island. A zinc-phosphide poisoning program was conducted during 1978. A 97% reduction in the rabbit population was achieved. However, follow up to the program was insufficient and the rabbit population returned to pre-control levels. Since then, shooting has been the only control method used on the island. The actual rabbit population is unknown. It is estimated to vary between 40 and 300 or more rabbits annually.

Alternatives to poisoning rabbits on Destruction Island include: shooting, trapping, biological controls, and no action. Shooting and trapping will not provide complete control and will have to be repeated annually to keep rabbit numbers in check (Paul O'Neill, US Department of Agriculture - ADC, personal communication 1992). The use of a mammalian biological control agent such as the myxoma virus is limited because there are insufficient insect vectors to spread the disease, nor is it prudent to introduce a mammalian disease in an area where the effects on marine mammals are unknown.

Proposed action(s): Zinc-phosphide poison, in conjunction with mechanical means (shooting, trapping, or snaring), will be used to eradicate the rabbits. An intra-Service Section 7 consultation of the use of zinc-phosphide for controlling rabbits on Destruction Island was conducted in 1989. The consultation concluded that the use of zinc-phosphide and shooting would not be likely to affect any threatened, endangered, or non-target species on and in the area of Destruction Island. Species of concern that use the island include the bald eagle (*Haliaeetus leucocephalus*), a listed threatened species, and the Destruction Island shrew, a candidate species for protection under the Endangered Species Act of 1973, as amended.

The Animal Damage Control (ADC) of the U.S. Department of Agriculture will implement the eradication effort through a contract with the Service. The ADC will obtain all necessary supplies and permits, including a restricted use permit for zinc-phosphide, to conduct the operation. At the end of each field season, ADC will provide an annual progress report to Nisqually NWR. The report will summarize the operation activities and achievements, a census of the remaining rabbits, and proposals for necessary follow up work.

Prior to initiation of rabbit eradication, Nisqually NWR will prepare an Environmental Assessment (EA) of the alternative and will ensure that the alternative meets the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended. Nisqually NWR will coordinate the timing of the operations and manage the contract with ADC. Nisqually NWR will provide to the Olympia State Office copies of the ADC reports and recommendations for future actions on an annual basis. Nisqually NWR will submit to the Regional Office a pesticide use proposal for this action for approval in accordance with the Department of the Interior's and Service's pest management policy (30 AM12.1).

To evaluate the success of the eradication effort, quantitative samples of plant community characteristics and seabird nest burrow densities will be collected prior to and following rabbit eradication. Plant community characteristics will include abundance, species composition, and assemblage distribution. The evaluation will include mapping and quantifying the vegetation community using aerial photographs and by conducting on-site surveys of vegetation and seabird nest burrow density in permanent sample plots. Reports will be prepared at the end of each field season summarizing the sampling results. A final report documenting and evaluating the effects of eradicating the rabbits on the island's vegetation and seabird nest burrow density will be prepared and provided to the Olympia State Office.

Location(s): Destruction Island, Washington.

Schedule: Prepare the EA during early 1994. Following completion and approval of the EA, initiate site evaluation in late 1994 by mapping existing vegetation, selecting sample plots, and establish base-line seabird nest burrow density. As the turf grass community should respond quickly to a reduced rabbit population, sampling will be repeated in 1996 and then three or four years following elimination of the rabbits. Initiate rabbit eradication in 1995 and continue until the rabbit population is eliminated, which is estimated to take between two and four years. On-site activities will be restricted to October, November, December, and January so that breeding seabirds will not be disturbed.

Estimated Budget: $94,000

### 4.3 Preferred Alternative - Net Fishery

Goal(s): The goals of this alternative are to: 1) delineate and describe seabird mortality resulting from the incidental take of seabirds in Washington net fisheries; and, 2) if mortality is found to be significant, identify, develop, and implement a strategy to reduce or eliminate those losses.

Justification: As discussed in Sections 2.2 and 2.3, there is potential for seabird, particularly common murre, mortality to result from net fisheries in Washington. The number of mortalities and the impact on Washington breeding colonies are not documented. Based on reports of some fishermen, mortality could be substantial (Atkins and Heneman 1987; Speich and Wahl 1989).

Management actions to reduce incidental take of seabirds in net fisheries were successfully implemented in California (Takekawa, et al. 1990). Similar or other actions could be implemented in Washington to reduce the incidental take of seabirds. The potential decrease in seabird mortality as a result of these actions may contribute to the restoration of Washington common murre populations. However, the current information on incidental take in Washington is insufficient to propose and implement any actions that would alter fishing methods and/or seasons. Further, the current information is inadequate to identify the actions that would be most appropriate.

Proposed action(s): Investigate and implement measures to reduce the number of incidental seabird mortalities resulting from net fisheries in Washington State. Investigative actions will include assistance to the National Marine Fisheries Service (NMFS) and Bureau of Indian Affairs (BIA) to analyze and interpret data collected by net fishery/marbled murrelet observer programs conducted on the all-citizen and tribal fisheries. These observer programs were begun in 1993 as a result of two endangered species formal consultations with the Service. In addition to marbled murrelet data, NMFS and BIA will collect data on all species of seabirds caught in net fisheries.

A report will be prepared which addresses past and present net fishery conditions in Washington State. The report will include: 1) the extent of net fisheries, 2) the areas where these fisheries and seabird habitat overlap, 3) agencies which regulate the fisheries, 4) the laws and regulations controlling the fishery, 5) total seabird mortality from the fishery and its impact on Washington seabird populations, 6) options for reducing or eliminating seabird mortalities due to net fisheries, 7) a strategy for eliminating, reducing, and/or mitigating those losses, and 8) a budget for implementing the proposed strategy. The strategy will be submitted as a revision to the plan prior to its implementation.

The investigation and report will be conducted and prepared by the Olympia State Office. Depending on the recommended strategy's expected benefits to seabirds, feasibility, and any budgetary constraints, the Plan will be revised by the Olympia State Office to incorporate and implement the recommended strategy.

The Service does not have direct authority to regulate commercial or recreational fisheries. However, under the Migratory Bird Treaty Act (Act) of 1918, as amended, the take, capture, or killing of migratory birds is prohibited. Therefore, the Service will seek the assistance of other natural resource trustees, particularly the NMFS, the Washington Department of Fisheries, the Washington Department of Wildlife, the Tribal Fisheries, and the BIA in conducting the investigation, developing and implementing the strategy for reducing incidental take, and making recommendations for new fishery regulations.

Location(s): The Washington coast from the Columbia River to Port Townsend and up to the Canadian border.

Schedule: Initiate the three-year investigation in 1994.

Estimated Budget: $120,000

### 4.4 Preferred Alternative - Monitoring

Goal(s): The primary goal of this alternative is to document the changes in the number of common murres to determine if implemented restoration alternatives are effective or if other alternatives are more appropriate. Factors impacting seabirds, such as disturbances and spills, in the census area will also be recorded.

Justification: Monitoring is necessary to determine the efficacy of the selected restoration alternatives. As stated in Section 2.3, it is not understood why the common murre population off the coast of Washington has remained at such low levels for the last ten years. Several factors have been identified which may be suppressing the population. Increased monitoring of the colonies will provide some information about factors suppressing the common murre population. As these factors are identified, the Plan can be modified to include alternatives which address those factors.

Proposed action(s): Common murres attending traditional colony sites located on the Washington coast will be censused four times during the breeding season. Observers or time lapse photography will be used to monitor selected common murre colonies. Additionally, seabird colony disturbance data will be collected from the shore and during aerial surveys.

Nisqually NWR conducts an annual aerial census of breeding seabirds on the coastal NWR islands. It is proposed to census breeding birds on islands that traditionally contain common murre colonies an additional three times per breeding season. The additional surveys will provide more accurate estimates of the breeding populations of common murres on the Washington coast than the estimates currently obtained by a single survey flight.

Nisqually NWR will conduct the surveys and photographic analyses. During the flight, individuals in small colonies will be counted and photographs will be taken of the larger colonies. Attendance at large colonies will be quantified from photographic analysis. An annual report will be provided to the Olympia State Office detailing the survey results, especially noting numerical or behavioral changes in the breeding bird populations, a discussion of the results, and recommendations for future management.

Observer and/or time lapse camera stations will be established at selected common murre colonies in Washington to photograph breeding, brooding, and chick rearing behaviors. The observations will be reviewed for indications of abnormal breeding behavior, inadequate food supplies (as evidenced by chicks not getting fed), and other factors that may elucidate what is inhibiting common murre population growth.

Currently the NPS patrols the shoreline of the ONP and keeps watch on the NWR islands located within the park boundaries through an existing Memorandum of Understanding (MOU) with the Service. During the marine bird nesting season, the NPS has up to eight personnel stationed on the ONP coast from the north end of Shi Shi Beach south to the Hoh River. These rangers provide round the clock, seven days per week coverage at wilderness ranger stations and cover the remaining shoreline in roving patrols. As part of their routine activities, they will provide frequent surveillance of the offshore rocks and islands. In addition, personnel based at permanent ranger stations at Kalaloch, Mora, and Lake Ozette can provide additional, although sporadic, observations.

The NPS will record incidents of low-flying aircraft (civilian and military), trespass, encroaching boats, and other significant incidents on seabird breeding islands. Time, date, location, activity and description and identifying numbers of craft and the reaction of the wildlife will be noted. Visitor reports will also be recorded as well as observations of non-enforcement personnel. Incidents where enforcement action is possible will be dealt with immediately; all others will be tallied and submitted to the Service at the end of each season.

**Location(s)**: Aerial surveys will be conducted at NWRs on Washington's outer coast and Tatoosh Island. Observer/camera stations will be established at Point Grenville and/or Tatoosh Island. Shoreline survey areas include the north coast (Shi Shi to Cedar Creek), the south coast (Cedar Creek to Hoh River), and Kalaloch Ranger Station to observe Destruction Island.

**Schedule**: Initiate aerial and shoreline surveys during the 1994 breeding season. Aerial surveys will be conducted annually during June and July for 10 or more years. Conduct ranger patrols from May to September annually. Establish observer stations and/or install time lapse camera equipment prior to the 1994 breeding season and monitor for two or more seasons.

**Estimated Budget**: $149,000

## 5.0 THRESHOLDS

While, the Service's ideal goal for restoration is to increase the average attendance at breeding colonies on the Washington Coast by 30,000 common murres, it is recognized that not all of the common murres impacted by the spill were breeding adults. The proportion of adults to juveniles was not determined making it impossible for the Service to determine exactly how many breeding common murres to restore. Additionally, the lack of data about Washington's common murres and the current state of seabird restoration science make it difficult to select measures which will result in the successful restoration of common murres in Washington and will meet this goal. Because of these factors, the Service is also unable to predict if or when this goal could be achieved.

The lack of baseline data precludes the use of quantitative thresholds and performance standards to determine the effectiveness of the alternatives. However, trends data will be collected which will be analyzed in conjunction with best professional judgement to determine the effectiveness of a particular alternative.

Monitoring of the average annual attendance at common murre colonies on the Washington coast will be used to determine if the Net Fishery and Education alternatives are effective. Implementation of recommendations developed in the Net Fishery alternative should result in greater survivorship of seabirds, which should translate into increased common murre colony attendance. It is expected that the education alternative will prevent and/or reduce disturbance of seabird colonies. Although the direct effect of the Education alternative on seabird populations is not measurable, reduced disturbance should result in increased reproductive success. The Education and Net Fishery alternatives will be considered successful if the average annual number of common murres attending traditional breeding sites on the Washington coast increases. Additionally, disturbance incidents will be recorded as part of the Monitoring alternative. A downward trend in the number of incidents recorded annually relative to total ONP visitor use will indicate that the alternative is successful.

The Destruction Island Habitat Improvement alternative will be successful when censuses show that: 1) rabbits are totally eradicated from the island; 2) vegetation conditions on the island have improved from pre-rabbit eradication baseline; and, 3) seabird nest-burrow density has increased. If a single viable pair remain on the island, the rabbit population will explode as it did during prior treatments. It is expected that the eradication of the rabbit will improve vegetative conditions on the island which will decrease the amount of erosion and thus improve habitat conditions for burrow nesting seabirds and endemic mammalian species.

The Plan will be subject to an annual review by the Olympia State Office, Nisqually NWR, and contractors. Reviews will determine the efficacy of and suggestions for improving the implemented alternatives. Proposals for new alternatives will be discussed during these reviews.

Proposed revisions to the Plan will be reviewed for approval by the Olympia State Office and Nisqually NWR. Major revisions will also be subject to public review. Revisions to the Plan will be guided by documented evidence and/or best professional judgement. The Monitoring and Net Fishery alternatives will identify management actions to be proposed as revisions to the Plan. For example, other alternatives such as social stimulation will be considered if the Monitoring alternative data indicate that they are appropriate and will enhance restoration.

## 6.0 SCHEDULE AND BUDGET

The schedule and budget will be completed when the Plan is finalized following public meetings and an opportunity for written public comments. At that time the final alternatives will be selected for implementation and it will be possible to detail schedules and budgets.

Table 2 shows the estimated total budget of the preferred alternatives. At this time, the Education and Monitoring alternatives are anticipated to take 10 years. A 6% rate of inflation was applied to annual budget estimates to calculate future outlays. Selected alternatives will be continued until all funds are expended.

The total estimated budget shows an excess of funds. These funds will be used to cover costs that exceed the estimated costs and/or to finance new alternatives identified and approved for implementation during the annual review of the Plan.

Cost tracking will be performed by Olympia State Office and/or the Region 1 Regional Office. The estimated budget includes an allocation for restoration planning and implementation not to exceed $50,000. These funds are to be used to cover the costs of drafting the Plan, conducting the public reviews, and implementing and managing the selected alternatives.

The budget will be subject to an annual review by the Olympia State Office. The budget will be revised annually to incorporate the actual costs of conducting the restoration activities and new costs resulting from modification of the Plan.

## 7.0 ENVIRONMENTAL COMPLIANCE

The EA for the Education, Net Fishery, and the Monitoring alternatives will be prepared following public review and comment on the draft Plan. An EA of the

Destruction Island Habitat Improvement alternative would be prepared as a separate document by the Nisqually NWR. Additionally, a Section 7 consultation under the Endangered Species Act of 1973, as amended, would be conducted at that time. A pesticide use proposal for rabbit eradication will be prepared to comply with the Department of the Interior's and Service's pest management policy (30 AM12.1).

The Plan will be revised in the future to incorporate the strategy to reduce incidental take of seabirds in net fisheries as proposed in the Net Fishery alternative. It is also likely that the Plan will be revised to incorporate new alternatives which will enhance the restoration process. Appropriate NEPA documentation for any significant revisions to the Plan will be prepared and submitted for public review and comment.

The Monitoring alternative is a nonintrusive project which qualifies for categorical exclusion under the National Environmental Policy Act (NEPA) of 1969, as amended. Section 1.6 of the Department of the Interior Departmental Manual (516 DM 2 Appendix 1) states that non-destructive data collection and inventory and monitoring activities qualify for categorical exclusion pursuant to 516 DM 2.3A(2).

## 7.1 ENVIRONMENTAL CONSEQUENCES

The environmental impacts of the Education alternative and the investigative portion of the Net Fishery alternative are not significant. Increasing the number of common murres attending breeding sites to former levels will not have a major effect on the ecosystem. The Washington population may be at a level from which it can not recover on its own without restoration. Further, the population may be at such a low level that the breeding population could be further reduced and ultimately eliminated from the Washington coast by additional catastrophic events.

Expected environmental effects which can not be avoided should the alternatives be implemented include:

1. Decrease in disturbance at breeding colonies should result in increased reproductive success of common murres at coastal Washington and Oregon breeding colonies. An increase in reproductive success may lead to greater numbers of breeding common murres in Washington which will maintain Washington State's species diversity and restore the common murre to its former abundance.

2. Warning signs on Destruction and Ozette Islands will create a visual impairment. Visitors seeking a wilderness experience may be affected by the visual impact of the signs. However, viewing opportunities will not be eliminated by the signs, and overall wildlife viewing opportunities may be enhanced through the reduction in disturbance.

3. Implementing the net fishery-seabird mortality reduction strategy may have some adverse effects on commercial and recreational fishing opportunities in the area. As this strategy is yet to be identified, the potential environmental impacts are unknown.

Appropriate NEPA documentation will be prepared when the strategy is proposed as a revision to the Plan. The anticipated environmental effect of the strategy is to maintain Washington State's species diversity and abundance through reducing the incidental take of common murres, marbled murrelets (a Federally, and soon to be State, listed threatened species), and other seabirds in net fisheries. It is expected that a reduction in common murre mortality will help restore the species to its former breeding level in Washington State.

## 8.0 SUMMARY

This restoration plan focuses on determining and reducing the effects of factors which impede common murre survival and reproduction in Washington State and diminishing human perturbations at Oregon and Washington seabird colonies. The following actions are proposed by the *Nestucca* Oil Spill Restoration Planning Committee:

1) educate pilots, boaters, fishermen, and other visitors to the Washington and Oregon coasts and National Wildlife Refuges about protected wildlife resources in these areas and explain the reasons for and methods of minimizing disturbance to seabirds and other wildlife;

2) improve habitat conditions for burrow nesting seabirds by eradicating the introduced European rabbit (*Oryctolagus cuniculus*) from Destruction Island;

3) delineate and describe seabird mortality resulting from the incidental take of seabirds in Washington net fisheries and identify and implement measures to reduce the mortality; and,

4) monitor common murre attendance at Washington breeding colonies to determine if the selected restoration actions are successful and to identify detriments to the survival and reproductive success of common murres and other seabirds.

The implemented restoration alternatives will be reviewed annually to determine if they are effective. If it is determined that the actions are not succeeding or other more effective alternatives are identified, the restoration plan will be revised.

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## 10.0 APPENDIX 1 - CONSULTATION AND COORDINATION WITH OTHERS

This document was drafted by Jeffrey Momot of the Service's Olympia State Office. The Committee members discussed ideas for restoration and provided restoration alternative proposals, portions of which were incorporated into the document. The Committee members also reviewed and commented on all drafts of the Plan.

Members of the Committee are:

| | |
|---|---|
| Tom O'Brien | U.S. Fish and Wildlife Service, Region 1 Regional Office, Portland, Oregon |
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| Paul Crawford | U.S. National Park Service - Olympic National Park, Port Angeles, Washington |
| Jeff Skriletz | Washington Department of Wildlife, Olympia, Washington |

The following provided document reviews and/or ideas for restoration alternatives:

| | |
|---|---|
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| David Nysewander | Washington Department of Wildlife, Olympia Washington |

| | |
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| Ulrich Wilson | U.S. Fish and Wildlife Service, Washington Coastal Refuges, Port Angeles, Washington |

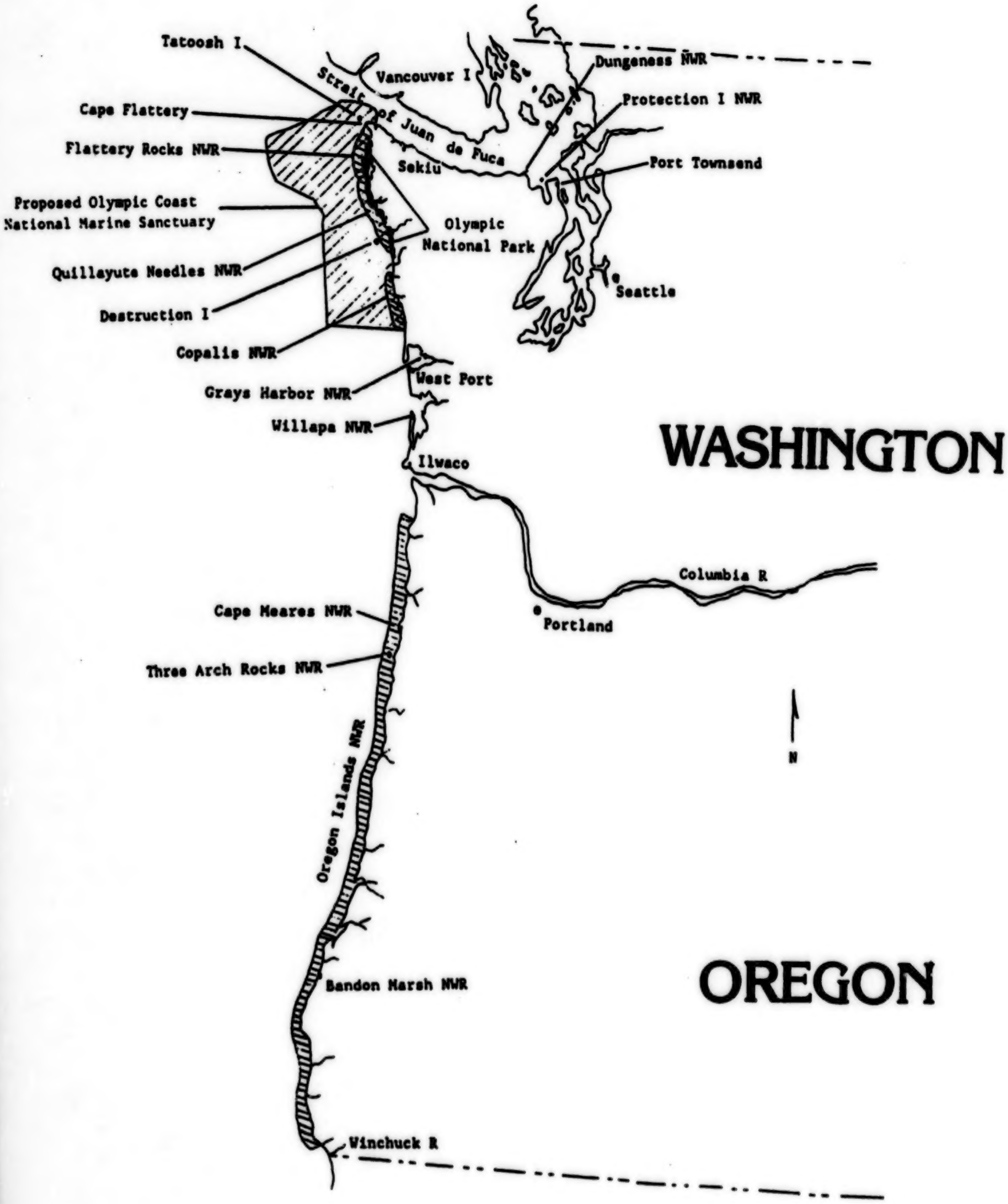
**Table 1:** The number of birds recovered during the 1988 *Nestucca* oil spill bird rescue and rehabilitation operations. The total estimated mortality for each species was calculated by multiplying the best estimate of total mortality (55,912) due to the spill (Ford, *et.al*. 1991) by the percent of total recovered. Species are listed in taxonomic order. Species that breed in Washington are denoted with an asterisk (*). Subtotals for selected groups are denoted in the hatched areas (▨).

| SPECIES | NO. OF INDIVIDUALS RECOVERED | PERCENT OF TOTAL RECOVERED | TOTAL ESTIMATED MORTALITY |
|---|---|---|---|
| Loons | | | |
| Red-throated | 4 | 0.03 | 17 |
| Common * | 2 | 0.01 | 8 |
| Pacific | 14 | 0.11 | 58 |
| Unidentified | 64 | 0.47 | 266 |
| [illegible] | [illegible] | [illegible] | [illegible] |
| Grebes | | | |
| Horned | 11 | 0.08 | 46 |
| Red-necked | 2 | 0.01 | 8 |
| Western | 97 | 0.72 | 402 |
| Unidentified | 669 | 4.96 | 2,776 |
| Total grebes | [illegible] | [illegible] | [illegible] |
| Fulmar (Northern) | 53 | 0.39 | 220 |
| Petrel * | 11 | 0.08 | 46 |
| Shearwater | 13 | 0.1 | 54 |
| Unidentified Tubenose | 5 | 0.04 | 21 |
| Cormorant | | | |
| Brandt's * | 1 | <0.01 | 4 |
| Unidentified | 15 | 0.11 | 62 |
| Goose (Canada) * | 1 | <0.01 | 4 |
| Mallard | 1 | <0.01 | 4 |
| Canvasback | 1 | <0.01 | 4 |
| Scaup | 1 | <0.01 | 4 |
| Oldsquaw | 2 | 0.01 | 8 |
| Scoters | | | |
| Black | 24 | 0.18 | 100 |
| Surf | 89 | 0.66 | 369 |
| White-winged | 489 | 3.63 | 2,029 |
| Unidentified | 691 | 5.13 | 2,868 |
| Total scoters | [illegible] | [illegible] | [illegible] |
| Goldeneye * | 4 | 0.03 | 17 |
| Bufflehead | 9 | 0.07 | 37 |
| Hooded Merganser * | 1 | <0.01 | 4 |
| Coot | 1 | <0.01 | 4 |
| Dunlin | 6 | 0.04 | 25 |
| Sandpiper | 1 | <0.01 | 4 |
| Gulls | | | |
| Mew | 2 | 0.01 | 8 |
| Ring-billed * | 1 | <0.01 | 4 |
| Herring | 8 | 0.06 | 33 |
| Glaucous-winged * | 2 | 0.01 | 8 |
| Kittiwake | 23 | 0.17 | 95 |
| Unidentified | 242 | 1.8 | 1,004 |
| Total gulls | [illegible] | 2.06 | 1,152 |
| Murre (Common) * | 8,091 | 60.05 | 33,577 |
| Guillemot (Pigeon) * | 1 | <0.01 | 4 |
| Murrelets | | | |
| Marbled * | 2 | 0.01 | 8 |
| Ancient * | 4 | 0.03 | 17 |
| Unidentified | 11 | 0.08 | 46 |
| Total murrelets | [illegible] | 0.12 | [illegible] |
| Auklets | | | |
| Cassin's * | 1,076 | 7.99 | 4,465 |
| Parakeet | 1 | <0.01 | 4 |
| Rhinoceros * | 36 | 0.27 | 149 |
| Unidentified | 161 | 1.19 | 668 |
| [illegible] | [illegible] | [illegible] | [illegible] |
| Puffins | | | |
| Horned | 3 | 0.02 | 12 |
| Tufted * | 4 | 0.03 | 17 |
| Unidentified | 5 | 0.04 | 21 |
| [illegible] | [illegible] | [illegible] | [illegible] |
| Unidentified alcids | 282 | 2.09 | 1,170 |
| [illegible] | [illegible] | [illegible] | [illegible] |
| Crow * | 4 | 0.03 | 21 |
| Pheasant | 1 | <0.01 | 4 |
| Unidentified birds | 1,231 | 9.14 | 5,108 |
| Total | 3,137 | 13,473 | 55,912 |

**Table 2:** Estimated budget for the preferred alternatives for restoration of resources injured in the *Nestucca* oil spill.

| Alternative | Total Estimated Budget | Estimated Number of Years |
|---|---|---|
| Education | $ 85,000 | 10 |
| Destruction Island Habitat Improvement | $ 96,000 | 5 |
| Net Fishery | $ 120,000 | 3 |
| Monitoring | $ 149,000 | 10 |
| Subtotal | $ 450,000 | |
| Restoration Planning and Implementation Costs, (not to exceed) | $ 50,000 | |
| Total | $ 500,000 | |

Figure 1: Locations of proposed restoration actions. The actions proposed in the preferred alternatives would occur along the coast between Port Townsend, Washington and the Winchuck R, Oregon.



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